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The Technical Journal of the Soap and Edible Oil Trades

Official Organ of
The American Oil Chemists' Society

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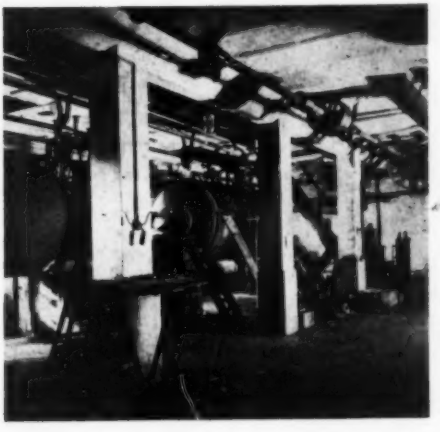

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Chief Chemist, New York Produce Exchange
2 Broadway, New York City

Vice-President, A. W. PUTLAND
Portsmouth Cotton Oil Refining Corp.
Portsmouth, Va.

Secretary-Treasurer, J. C. P. HELM
Helm Laboratories, 705 Tchoupitoulas Street, New Orleans, La.

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VOLUME 4. NOVEMBER, 1927 NUMBER 11

CONTENTS

Modern Deodorizing Methods. *By J. P. Harris and A. B. McKechnie* 371

Packages for the Palm Oil Trade 378

Oil Chemists Meet in New York 380

Meal Settlings Damage Crude Oil. *By E. R. Barrow*..... 383

Is This Where Your Profits Are Going? *Editorial*..... 387

President's Mid-Year Report, A.O.C.S. *By H. P. Trevithick* 388

American Oil Chemists' Society, Notes and Correspondence.. 391

Stearic Acid and Red Oil Specifications 396

The Standardization of Oil for Mayonnaise. *By Rosalind U. Norris* 397

Third Quarter Census Report.. 400

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OIL & FAT INDUSTRIES

VOLUME 4. NOVEMBER, 1927 NUMBER 11

Modern Deodorizing Methods

Quality of Edible Oils Dependent Upon Design of Distilling Equipment

By JOHN P. HARRIS* and ALEXANDER B. McKECHNIE*

MANY of us have seen and can recall the original deodorizing tanks that were at the plant of the N. K. Fairbank Company at Chicago. (This plant is now dismantled.) If they were not actually the first treating tanks for vegetable oils in the United States, they were certainly among the first of their kind, and were typical of that early period. They were merely steel holding tanks in which neutralized oil was stored, and heated with pressure steam which passed through a closed coil.

Early History of Deodorizing

During the heating process, the oil was blown with steam, which carried away certain of the more volatile compounds, producing a decidedly beneficial effect upon the flavor and odor, as compared with the untreated oil. This process was far from perfection, but nevertheless was a step in the right direction. The entire layout and process would now be considered crude, to say the least, yet a number of years passed before any radical improvements were made.

It may interest and surprise some readers to learn that there are still a number of refineries throughout the country producing edible vegetable oils and lard compounds with equipment and methods as antiquated as in this first installation; yet in spite of this, and the great advancement made in this highly specialized field, they claim to produce choice products of the highest quality.

Introduction of Superheated Steam

One of the first great improvements was made when superheated steam was introduced for the blowing process.

Before this time, steam at 125 lbs. boiler pressure was ordinarily used. This pressure gave a final temperature in the oil of about 345°F., after many hours of heating.

When superheated steam was introduced for blowing, it not only proved to be a better medium for carrying away the distilled vapors, but it also produced a rise in the final temperature of the oil to approximately 390°F. This higher

* Parks-Cramer Company.

temperature shortened the deodorizing process to about five hours, and also caused the distillation of a higher percentage of the volatile compounds, which in turn made a further improvement in the flavor and odor of the finished oil. Up to this time, however, all of this work was carried on under atmospheric pressure, and the greatest gain in quality was still to come by the use of vacuum distillation.

Vacuum Deodorizing

As the demand for edible vegetable oil products increased, alert refiners began searching for new ways to further improve the quality, and it is natural that the distillation of the volatile bodies under vacuum should be the next step in a process of this kind.

Vacuum distillation, particularly in connection with vegetable oils, serves two major purposes—

First—It minimizes the damage caused by oxidation, which was all too prevalent when the oil was distilled under atmospheric pressure and exposed at its highest temperature to the open air.

It is a well known principle that a vegetable oil possesses a great affinity for oxygen, especially at temperatures above 140°F., and when exposed at this temperature to the air, it will absorb the oxygen therefrom. As the temperature of the oil increases above 140°F., its rate of oxygen absorption actually accelerates in proportion to the temperature increase.

Second—The use of a vacuum materially lowers the boiling or distilling point of the volatile compounds, just as the boiling point of water is lowered from 212°F., at atmospheric pressure to 32°F., when a perfect vacuum is attained. Consequently, an equivalent degree of heat applied to oil, under a high vacuum, produces an exceptionally better result than when applied at atmospheric pressure.

The attitude of certain manufacturers, when they persist in their policy of "We are getting by, why change?" is a strange commentary upon the tastes of the American public, and it is, indeed, puzzling to know that huge quantities of oil are still being deodorized, or supposed to be, without the use of the vacuum still.

Oxidation of vegetable oil is directly attributable to exposure to any source of oxygen absorption, and as this makes the oil incipiently rancid, its life, or keeping quality, is very short. Under such conditions, therefore, as open distillation with temperatures of only 345°F. in the oil, the undesirable flavors and odors cannot be entirely driven off, and yet this is the whole purpose of the deodorizing process.

It is true, of course, that a certain trade will buy an inferior product, if they can get it at a favorable price, and will even become accustomed to an off flavor, rating it as "quality."

Cases are known of refiners who boasted of "bland neutral flavor," which actually was merely a flat oxidized flavor, and still others mistook a soapy flavor for "sweet nutty flavor."

Modern practice, insofar as the deodorizer is concerned, is to use vessels of rugged construction sufficiently strong to withstand the highest vacuum that can be produced, and equipped with high vacuum pumps and condensers for distilling the vapors driven off. The high quality of oils which are produced in equipment of this kind, has placed this process on a highly scientific basis, and caused the refiners to seek still further means of improvement.

It was immediately apparent that steam, under the pressures ordinarily available, did not offer a medium for heating which was conducive to efficiency, inasmuch as about five hours were required to raise the temperature to 380°F.-390°F. When 200 deg. superheat was used above the boiler pressure steam, the effect produced in the early hours of deodorizing was very slight, and it was found that a maximum of 380°F.-390°F. was not sufficient, in view of the fact that temperatures considerably higher than 400°F. (and under high vacuum), are necessary, in order to distill off the aromatic aldehydes and ketones commercially.

Heating by Direct Fire

The obvious method for correcting these inefficiencies was to heat the oil directly by the use of a tubular heater, or pipe still.

This consisted of a large coil through which the vegetable oil was circulated for heating, the whole being mounted above a direct fired furnace setting. This oil was kept in constant circulation by a pump which forced it from the deodorizer through the tubes of the heater and then returned it to the deodorizing tank.

A number of these direct fired heaters have been installed, and doubtless some of them are in successful operation. The design of such a heater requires the utmost engineering skill of a trained specialist, and even when perfectly designed and constructed, vagaries of operation will lessen or greatly depreciate the uniformity and value of the product being treated.

The oil comes in direct contact with the tubes which are exposed to the fire, and as all the heat for the body of the oil must pass through the film in contact with the heating surface, it is obvious that this film must necessarily be raised to a temperature higher than is required in the batch. Such overheating must have only one effect, and that is, to burn or scorch the oil, considerably darkening its color and affecting its taste unfavorably.

With this type of pump-over system, there is the ever present danger of ruining an entire batch of oil in the event of a shutdown of the circulating pump either for mechanical reasons, or because of an interruption in the current supply to the electric motors. Under such conditions, it is also probable that considerable damage would result to the heater.

With this method of heating, there is further, difficulty in maintaining the desirable high vacuum on the equipment, as it is almost impossible to secure permanent tightness through a multiplicity of pipe joints, valve stems, pump stuffing boxes, etc.

The losses sustained through the use of this direct fired heating method have been so great that many such installations have been abandoned, and the plant converted back to the older method of heating with superheated pressure steam with a lower resultant temperature in the vegetable oil.

It was only natural, therefore, that the refinery operators should continue in their search for a method of heating that would combine both the good qualities of the high temperature of the direct fired system, and the freedom from overheating of the steam system, without having the disadvantages of either.

The result of this search has led to the use of the well-known system of "Industrial Heating by Oil

Circulation." This system uses a high flash mineral oil to convey the heat to the deodorizers, and was primarily designed for furnishing heat at high temperatures and low pressure for work beyond the range of steam, for delicate reactions and sensitive compounds, which, of course, include vegetable oil deodorizing.

Indirect Heating

This system was perfected about 12 years ago, and is best described as being similar to the ordinary hot water heating system, with the exception, of course, that a high flash point mineral oil is used as the transmitter of heat instead of water. This mineral oil is kept in rapid and positive circulation by means of a pump, instead of depending upon thermal circulation, as is the case with water.

This equipment is the result of many years of experience on the part of trained engineers, skilled in high temperature heating work. The absorber, pumps, pipe lines, etc., must be all of the most rugged construction in order that proper provision be made for temperature and expansion strains.

Design of Indirect Heating System

The absorber or mineral oil heater, like any high grade exchanger, is designed for maximum efficiency insofar as that is consistent with long operating life and low upkeep cost.

The furnace setting is well insulated to minimize losses by radiation. The length and size of the tubes and the velocity of the mineral circulating oil is such that the life of all these parts is indefinitely long.

The circulating pump is of sufficient capacity to maintain the proper tube velocity, and is the positive displacement, rotary type. This insures a uniform and non-pulsating flow.

The system is a closed type of circulating oil system, which is the correct principle for the handling of high temperature oxidizable oils, in that it is not permitted to come in contact with the atmosphere. A mineral oil has an affinity for oxygen, similar to that of vegetable oils, and must be also protected from the atmosphere by being entirely enclosed.

Provision is made for the expansion of the circulating oil, which has approximately a 25% volumetric increase in a 500°F. rise. An expansion tank, located on the end of a dead, or stagnant line, attached at the proper place in the system takes care of this expansion satisfactorily and acts as a liquid seal, thus insuring the exclusion of air. This tank is vented to the atmosphere, and does not permit the building up of high pressure. Tests have shown that the oil in the tank is several hundred degrees lower in temperature during operation than the oil in circulation.

The circulating oil is a highly refined derivative of mineral crude. Its flash and fire points, viscosity and specific heat, are all carefully regulated or determined for use in work of this kind.

The piping used for circulating the mineral oil from the heater to the deodorizer is laid out to properly provide for its expansion of 1/32″ per foot.

The piping is of standard weight, but all valves and fittings used are of extra heavy construction, and all flanges are forged steel, screwed and welded to the pipe. This heavy construction is employed in order to insure absolute tightness at all joints.

Such systems are built in standard sizes, ranging up to 2,800,000 B.t.u. per hour in individual units, and two or more units may be connected in a battery when greater quantities of heat are required than that contained in the largest system.

In vegetable oil work there are installations in which the deodorizers vary in size from 5,000 lbs. to 30,000 lbs. each, and are arranged in batteries of two, three, or more.

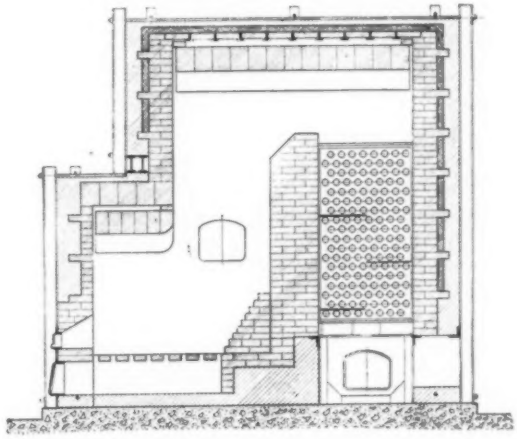
In addition to the vegetable oil industry, this method of heating has been successfully applied in chemical plants for high temperature heating, distilling, etc; in the manufacture of electrical equipment, such as transformer or dynamo coil impregnating, also molded electrical products; saturated asphalt roofing, shingles and asphalt coated paper; rosin and wax compounds, battery boxes, etc.

Advantages to the Vegetable Oil Industry

Through the use of circulating mineral oil, the application of heat to the vegetable oil is at a uniform rate, and at all times under perfect control. With thermostatic equipment at the heater, the mineral oil is easily held within a few degrees Fahrenheit of any pre-determined temperature, and individual control is further provided at each of the deodorizers by installing a three-way valve in the deodorizer branches.

The deodorizer can be either a jacketed vessel or a vessel of single shell type, with a coil of the proper heating surface installed therein.

It must be apparent to the reader that in the old method of slow steam heating, the live steam which is added for the purpose of assisting in the distillation of the objectionable volatile bodies, etc., is largely wasted during the major part of the operation until such time as the temperature considerably exceeds 300 degrees F., which usually takes several hours; or at best it merely serves to agitate the oil during that period to keep it from burning, and achieves very little in the way of real deodorization. In fact temperatures high enough for proper distillation are



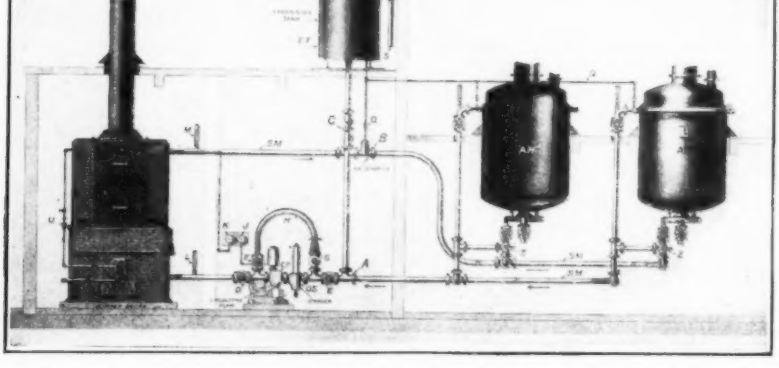
Typical furnace and coil cross-section for indirect heat deodorizing system

never achieved, even with 200 degrees of superheat plus 125 pounds boiler pressure in the heating coil.

Thus the mineral oil heating system in raising the temperature within approximately 30 minutes above 300 degrees F. and within an hour and a half or less, above the boiling or distilling point of the objectionable aldehydes, puts the

However, it is safe to predict a very material reduction in steam and time of processing in addition to the better quality produced.

The temperature of the mineral oil is high enough to perform the work, namely, to give 400°F.-500°F. in the vegetable oil, but its temperature is not high enough to be damaging to the product.



Indirect heat deodorizing layout, showing absorber, pump, expansion tank and two deodorizers, also mineral oil circulation lines

live steam used in distillation to work almost immediately, shortens the time of processing, and reduces the amount of live steam to be used in processing very materially (some users have reported a reduction in total steam consumed of as much as one-half pound of steam per pound of oil treated).

The personal element in judging when an oil is properly deodorized, however, is so deceptive that it is difficult to foretell just how much of a reduction in point of time and in volume of steam will be possible. Actually it is far more positive to predict an increase in quality, due to ability to go to those temperatures at which distillation is properly carried out, than it is to predict the exact amount of saving.

The mineral oil being distributed over the entire area of a jacket or heating coil comes in contact with all parts of the vegetable oil, and therefore, no one part of the vegetable oil is over-heated and scorched by transmitting heat through it to any other part. The vegetable oil (properly blown with steam from an independent, separately fired superheater), remains in the deodorizer, thereby simplifying the process and the maintenance of high vacuum. All air is thus excluded from the deodorizer, and there is no chance for outside air to enter.

The pressure on the mineral circulating oil, instead of being high, as when pressure steam is used, is almost negligible, as it is made up of merely the pipe friction, plus the

static head from the expansion tank.

Fire hazard can be minimized by installing the entire heating plant in a separate room or building, set any reasonable distance from the deodorizers.

The entire system operates at a comparatively high thermal efficiency, and through the natural preservative qualities of the mineral oil for all metallic parts, the annual upkeep cost is low.

Oxidation, the Greatest Danger in Deodorizing

In conclusion, it is well to repeat that when edible vegetable oil is raised to the high temperatures necessary to effect distillation of the undesirable aromatic components, it has a great affinity for oxygen, so that the operator or engineer shall be ever alert to remove possibilities of contact with the oxygen of the air or from any other source.

As already related, the best method of guarding against oxidation is the use of a vacuum in the deodorizing vessel.

Many operators appear to have too little appreciation of the necessity of keeping this equipment absolutely tight. No half-way measures will do, for if there are any leaks in the deodorizing vessel, the vacuum pump will pull air through the hot oil, damaging the oil much more than the vacuum helps.

There is, of course, always some danger of effecting a certain degree of oxidation from the steam itself, for some little air is commonly drawn into the steam through the boiler feed water as it is being evaporated.

Some operators, especially in Europe, have gone to the length of providing special boiler facilities to produce steam which will be absolutely free from air.

Other operators have attempted to use inert gases, such as hydrogen, nitrogen, carbon dioxide, etc., in the place of steam. Sometimes these gases, particularly hydrogen, are used to finish off the batch after the initial treatment with steam.

But of all methods commonly and successfully used to date, the safe indirect heat method has given the best quality result together with the highest efficiency in operation.

Surface Characteristics of Soap Solutions

In opposition to the generally favored hypothesis that the surface of aqueous soap solutions is made up of soap molecules, a theory is presented which consists in the main of the idea that the surface is built up of fatty acid molecules, which "verifies" the theory of Harkins and Langmuir to this effect. It follows from this hypothesis that a parallelism must exist between the surface phenomena of aqueous soap solutions and aqueous fatty acid solutions, a relationship which generally does exist.—J. F. Carrière (Chemische Umschau. No. 5. pp. 57-67. 1927).

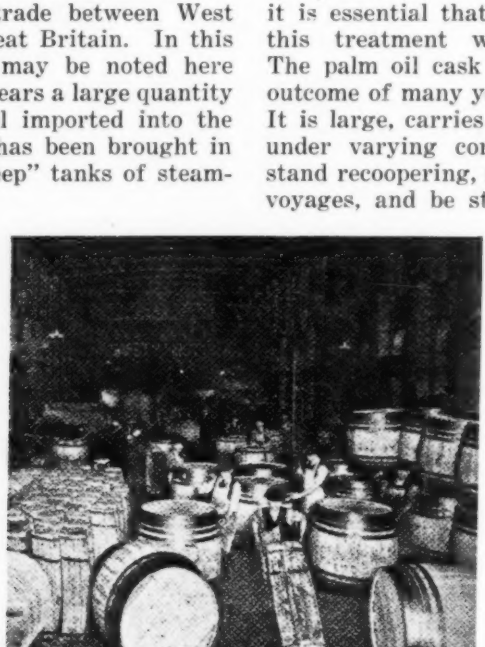
Prominent Norwegian Oil Merchant Visits U. S.

Mr. Johan Isdahl, Jr., of Isdahl and Company, Cod Liver Oil Merchants, Bergen, Norway, has been visiting the United States on a business trip. Mr. Isdahl's firm is one of the world's large handlers of Cod Liver Oil.

Packages for the Palm Oil Trade

American Red Oak Preferred by British Handlers of African Commodity.

READERS of OIL & FAT INDUSTRIES will be interested in the following extracts from an article in Commerce Trade Bulletin No. 486, describing the packaging and handling methods of the palm oil trade between West Africa and Great Britain. In this connection, it may be noted here that in recent years a large quantity of the palm oil imported into the United States has been brought in bulk in the "deep" tanks of steamships.



Assembling Palm Oil Casks from Shooks at Liverpool

Ninety Per Cent. of Palm Oil Imports Come Through Liverpool

Liverpool is the center of the United Kingdom palm oil trade, it being estimated that over 90 per cent of the palm oil imported into Great Britain from West Africa comes through this port. The palm oil cask must be of exceedingly strong construction in order to stand rough handling by native African labor. When full of oil, it weighs between 1,600 and 1,700 pounds; the barrels are rolled for many miles on the rough roads, and it is essential that they can stand this treatment without leakage. The palm oil cask of today is the outcome of many years' experience. It is large, carries a heavy weight under varying conditions, has to stand recoopering, make many long voyages, and be strong enough at the head to be slung with hooks when filled, and also be of sufficient unlisted; 44 by 1⅛ inches, second without damage.

American Staves Superior for Palm Oil Casks

The materials now used for the manufacture of these palm oil casks are the best that can be procured,

and for this purpose American staves have been found superior to all others and are used exclusively by coopers supplying this trade.

Palm oil staves are shipped to Great Britain principally from New Orleans and Galveston, and are chiefly of red oak. They may be either flat or circle bucked, and are imported both listed and unlisted. Listed staves are those which have square edges, while the unlisted are shipped as they leave the bucking machine without any dressing of the edges.

The following stave specifications are used for the manufacture of palm oil casks: 44 by 1⅛ inches, prime white and/or red oak, flat or circle dressed, listed 5 inches, average; 44 by 1⅛ inches, prime white or red oak, flat or circle dressed, unlisted; 44 by 1⅛ inches, second quality, white or red oak.

Second Quality Staves Seldom Used

The second quality staves are used in small quantities only. Heading for the casks is manufactured by local coopers out of third or fourth quality Canadian white or red pine lumber. The heading is finished to 38 and 40 inches diameter, principally the former, by 1½ inches thick. At opposite sides of the heading is inserted a small piece called a "cantel," which is made of oak, to strengthen the heading and to allow for the binding by the hoops.

Efforts have been made to introduce American palm oil shooks into Liverpool, but so far they have made little headway.

Palm Oil Casks Make Many Trips

The casks are sold by the coopers to firms engaged in the palm oil trade, and shipped to West Africa in shook form, whence they are returned filled with oil, and distributed to the soap and tinplate manufacturers, who are the largest consumers of palm oil. After being emptied they are resold to the coopers, who repair those that are damaged, and after cleaning and shooking they are sold again to the operators, and reshipped to West Africa.

Good Demand for Second Hand Casks

There is also a considerable demand for second hand casks—in fact, they are preferred to new ones by some palm oil operators on account of their absorbing less oil. While a sufficiently low ocean freight obtained in recent years, quantities of emptied palm oil casks were shipped to Liverpool from America and sold to the coopers. These casks, after being cleaned and repaired if necessary, were converted into shooks, and resold to the palm oil operators for shipment to West Africa again.

Palm Oil Cask Specifications

The Liverpool Produce Association specification for regular palm oil casks (the regular size of a Liverpool palm oil cask is 38 inches and is known as a 38-inch cask), November, 1920, new or second hand, follows:

Staves.—The staves shall be of oak, of a minimum length of 42 inches, with an allowance of 1 inch for wear and tear, and of a thickness of 1 to 1¼ inches.

Heads.—The heads shall be of white or red pine, with two oak cantels, and of a thickness of 1⅜ to 1⅝ inches.

Hoops.—The hoops shall be 10 in number, and of 2 inches by 14 Birmingham wire gauge.

Width.—The outside diameter at ends shall be from 38 to 44 inches.

Oil Chemists Meet in New York

First Autumn Meeting, Held at Chemists' Club, Declared Successful by Members Attending

ON Friday, October 28, the first Mid-year Meeting of The American Oil Chemists' Society convened in Rumford Hall, the auditorium of the Chemists' Club, at 52 East 41st Street, New York City.

The Autumn meeting is an innovation planned by Mr. H. P. Trevithick, President, to be an annual feature of the activities of the Society, primarily to promote interest in the Society's work among the many members who are unable, for one reason or another, to attend the Annual meeting, which is generally held in some Southern city in the Spring.

The expectations of the President and the Governing Committee were fully realized, and a large and enthusiastic attendance, rivalling in numbers the average attendance at the Annual meetings, voted the first Mid-year Meeting a complete success.

The program for the meeting was published in the October issue of OIL AND FAT INDUSTRIES, and the Minutes are published herewith.

On the evening of the same day a most enjoyable social feature was the Banquet, presided over by Dr. Wesson as Toastmaster, at which Dr. Charles H. Herty made an interesting address on the relations of American Chemical industry to the rapidly developing cartel or "trust" systems of European nations, with their interlocking trade agreements for division of world markets. Dr. Herty, who, through his position as head of the Chemical Foundation, is in close touch with all American manufacturers of dyestuffs and heavy chemicals, expressed confidence that our industries will not be caught napping, and will be prepared to obtain their share of the World's chemical business in the face of whatever developments the new European agreements may bring forth.

Dr. Herty's address was received with the most enthusiastic interest by the Members present, who extended him a rising vote of thanks for his able presentation of an absorbing topic.

Minutes of the Mid-Year Meeting

The following are the Minutes of the Meeting held Friday, October 28th, at The Chemists Club, New York City.

Alan Porter Lee was appointed as Acting Secretary.

The Meeting was called to order at 10:15 with 42 members and 10 visitors present.

After an explanation by the President of the history of the gavel which was presented to the Society by Dr. Battle several years ago, the first address was given. This was a history of the Society from its inception in 1909, which was given by Dr. David Wesson, one of the charter members.

The next number on the program was the President's report of the activities of the Society since the annual meeting in May. The President's Report is published in

full in this issue of OIL & FAT INDUSTRIES.

In lieu of the Secretary's report, Mr. Putland, Chairman of the Membership Committee, reported 37 new members; that 19 had resigned or were suspended for nonpayment of dues, leaving a net gain of 18. This is a very good showing for this time of the year.

The next address was given by Mr. I. G. Priest of the Bureau of Standards on the cooperative work of the Bureau of Standards and the American Oil Chemists Society. He also discussed the tests made on the color vision of the members present in Memphis last May and also discussed the possibility of testing Olive Oil by the use of the ultra violet ray. Mr. Priest's address will be published in full in an early issue of OIL & FAT INDUSTRIES.

After Mr. Priest's very interesting talk, there was quite a general discussion. Dr. Ittner desired to know whether the Olive Oils which apparently were extracted, had been refined and then tested.

Dr. Richardson discussed particularly the report on the Lovibond glasses and the cooperative work, and noted the fact that the magnitude of the variations in the color readings is about the same as the variations in the glasses themselves, and also suggested that the Society transmit these reports to the Tintometer Company in England, and suggest cooperation with them.

Mr. Priest replied, by stating, that he had already sent some reports to the Company, and also in answer to a question, replied that no other company was making the glasses. Mr. Priest had already written the Tintometer Co. in length, and suggested that the Society follow the matter up and this was agreed to, unanimously.

Dr. M. H. Ittner of Colgate then addressed the Society on the use of oils and fats in the soap industry.

The following Committee reports were then given:

H. C. Moore on the Smalley Foundation.

David Wesson on the Dubosq Colorimeter in which he outlined his plans, and on which instrument Mr. Priest has already done some preliminary work.

Dr. W. D. Richardson then discussed the Fat Analysis Committee, and its work, and called a meeting for two o'clock.

Mr. Priest then discussed the Dubosq Colorimeter, explaining how it was to be used. He said that the general tendency is to match brightness rather than hue, and suggested that the Society act on this question. He suggested that a sample of oil could be prepared which would equal 35 Yellow—7.6 in color and that this sample could be used as the standard in the Dubosq Colorimeter. He also believed that standard glasses could be obtained in America.

Mr. Irwin then discussed the Moisture Committee, and reported progress.

Dr. Wesson reported that Dr. Charles Herty and Dr. Browne of the Bureau of Chemistry have accepted positions as judges of the Chevreul Prize Contest.

The report of the Cake Color Committee was then given and followed by a discussion of the Basic Research Committee by Mr. Barrow the Chairman, in which he reported on the meeting in Washington during that week.

Reports were also given on the following Committees:

Dr. Louis M. Roeg, outlined the plan for the work on differentiat-

ing between pressed and extracted olive oil.

Mr. B. H. Thurman reported progress in the formation of his Committee and outlined the work to be done on Linseed and its products.

Mr. Guernsey of the Detergent Committee gave a preliminary report.

Mr. Cluff also reported for the General Refining Committee and for the three sub-Committees, Neutral Oil, Color and the Corn Oil Committee.

Mr. R. M. Chapman outlined his program for the Ammonia Committee.

Following these reports, Dr. F. H. Meisnest, Oil Expert of the Tariff Commission, gave an able address on the Production and Utilization of Fish Oils. His talk was very much enjoyed and the paper will appear in the Journal.

Among others, these were present:

I. G. Priest
Wm. E. Anderson
R. W. Bailey
E. R. Barrow
James Bassett
W. S. Baylis
A. K. Church
Arthur Delafontaine
W. H. Dickhart
A. A. Jackson
James E. Egan
C. V. Ekroth
Carleton Ellis
R. H. Fash
R. C. Hatter
W. H. Irwin
M. H. Ittner
B. N. Glick
M. F. Lauro
A. P. Lee
C. O. Lowe
E. T. Marceau
Miss Rosalind Norris
R. W. Perry
W. A. Peterson
A. W. Putland
W. D. Richardson
M. L. Sheeley
A. W. Thomas
B. H. Thurman
H. P. Trevithick
F. M. Turner
J. J. Vollertsen
David Wesson
L. C. Whiton
H. E. Corman
D. E. Bergen
R. W. Wehsler
F. H. Meisnest
Chas. Herty
J. P. Harris
P. C. Watson
F. L. Horine
H. M. Dickinson
R. M. Miller
L. M. Gill
J. M. Wilson
F. L. Hiller

The following members were at meetings of the N. Y. Committee, but were unable to be present at the fall meeting:

A. L. Chesley
H. E. Cutts
H. W. Valteich
C. V. Bacon

OIL & FAT INDUSTRIES

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Address Editor

OIL & FAT INDUSTRIES
220 W. 42nd Street
NEW YORK CITY

Meal Settlings Damage Crude Oil

Exhaustive Tests Show Advantages Gained by Removal of All Foreign Matter

By EDWARD R. BARROW*[1]

THE suddenness with which the cottonseed oil industry has been confronted with the new conditions following the recent changes in the trading rules placing a premium on "better than prime" crude oil has aroused the operators to possibilities never dreamed of before. It is rapidly changing the attitude of oil millers toward the production of their chief commodity. Formerly there had been no incentive to produce better grades of crude oil. In fact the quality of the oil has been thought by most oil millers to be something beyond their control—something "preordained" as it were. Frequently in the past there has been blending of "choice" or "prime" grades with "off" quality to produce a mixture that would pass the requirements for prime oil using the superior quality product on which there was no premium to improve the quality of the inferior, which was subject to penalty for its deficiency. Smart practice, of course.

It has been hinted that meal settlings were occasionally added to crude oil, provided the refining loss was less than 9.0%, the difference in value of the two commodities furnishing the inducement for such questionable practice. It is a well established fact that all crude oil contains an appreciable amount of meal or meats which oozes out from the presses. These impurities flow out with the oil and carry with them from seven to ten per cent of moisture. Under the presses is located a settling trough or tank through which the oil is made to travel from two to three times the length of the trough by means of baffle partitions, passing finally through an overflow outlet into a settling tank holding the production of a twelve hour watch or twenty-four hour run. Theoretically the light suspended matter termed "settlings" is supposed to settle out, although the oil is almost constantly in motion. The result is that large quantities of moist mealy matter are pumped to the storage tank when the settling tanks are emptied. The practice of cleaning settling troughs and tanks varies in different mills. In some they are cleaned frequently, after every watch, in others daily, and in others this foul smelling, fermenting mass is allowed to remain throughout the week.

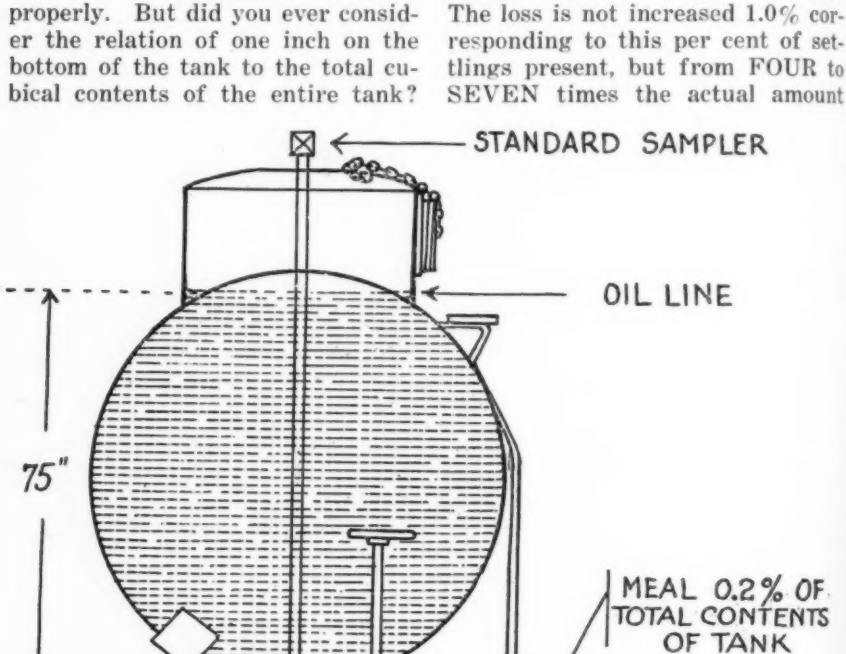
When loading tank cars it is the usual custom to pump from the bottom of tanks; and to make sure that settlings are evenly distributed, air is usually blown through the suction line, thus agitating the putrefying mass and exposing the entire contents of the tank to its contamination. Then the tank car is loaded. What happens to the settlings? Do they remain in suspension? Just as they settled out in the storage tank so they will be found on the bottom and the ends of the car a week or ten days later when the tank reaches destination. The constant jolting and jerking of cars in transit and on switch tracks tends to throw most of the settlings to the ends, but where considerable

* Barrow-Agee Laboratories, Memphis, Tenn.
[1] Published also in Cotton Oil Press.

settlings are present a layer also forms along the bottom of the tank and under the dome.

Along comes the Official Sampler with "a trier of uniform diameter of two inches" exactly in accord with the rules. He lowers it slowly into the oil until it reaches the bottom. The depth of the oil in the tank car is approximately 75 inches. Let us assume there is a ¾-inch layer of settlings on the bottom of the tank—this three-fourth (¾) inch represents then 1.0% of the 75 inches of sample drawn. The sample contains then 1.0% of meal settlings if drawn properly. But did you ever consider the relation of one inch on the bottom of the tank to the total cubical contents of the entire tank? It is but one-quarter of one per cent, approximately. Therefore, a ¾-inch layer of settlings on the bottom of the tank represents 1.0% of the sample, whereas it is in reality less than two-tenths per cent of the entire contents. Is it any wonder then that loading and destination samples frequently don't agree?

Now what becomes of the sample when drawn? Let us assume that it is analyzed immediately by the buyer, and if the seller acts promptly, is analyzed within three or four days by his chemist. The settlings are present. What is the result? The loss is not increased 1.0% corresponding to this per cent of settlings present, but from FOUR to SEVEN times the actual amount



Graphic representation of exaggerated effect upon standard sample of a small percentage of meal in the bottom of a tank car of oil

present according to the authority of some of the ablest refiners and chemists in the business and backed by loads of experimental data.

On the other hand let us assume that the seller fails to act promptly when notified of the claim of the buyer. Perhaps there is quibbling over the selection of the chemist or some other technicality. The sample reposes in a comfortably warm place in the laboratory or office. After several weeks delay word comes to send the sample to the chemist. What is the result? The free fatty acid has gone up tremendously—there is a big increase in refining loss and the color is several points darker, and all on account of a little messy meal settlings, that should not have been present in the first place. In these "prohibitous" times every one knows the effect of yeast in "home-brew." The meal settlings, always containing water, which is allowed to find its way into pure, clean cottonseed oil performs the same humble role as the yeast in "home-brew," except that the only "kick" in it is against the one who allows it to happen, and perhaps the poor chemist.

If you doubt what happens when meal and moisture are present, just try the experiment of moistening a half tumbler of good sound meats or meal with water and set in a nice warm place for a week or ten days. RESULT: — "Attar of Roses"—not much!

Crude cottonseed oil "free from water and settlings" as now produced does not exist, and yet the buyer knows that the seller pays the penalty for his folly or negligence and very charitably does not enforce this provision of the rules.

Crude cottonseed oil is a perishable commodity. When free from moisture and settlings it can be safely stored and will undergo very little change for an indefinite time. Besides free fatty acid, it contains certain mucilaginous, resinous, albuminoid matters which undergo changes that break down the neutral oil and increase the free fatty acid content. For this reason it is never advisable to store crude oil as such for long, extended periods.

As already pointed out and emphasized, the presence of moisture and settlings acts as an accelerator to these changes, and with favorable temperature conditions the increase in fatty acid and refining loss is sometimes very rapid.

In order to obtain data on the deterioration of crude oil and the effect of moisture and settlings upon its keeping qualities, this laboratory conducted a series of experiments using clear, well settled oil as the basis, and portions of the same oil to which were added different amounts of moist cotton seed meal and all of the samples stored under identical conditions, with the analysis of each sample being made every week. The results are so obvious that extended comment is unnecessary and as a practical illustration of the effect of meal settlings upon crude oil should convince the most skeptical. Careful study of these tables will prove interesting.

MORAL:—Keep meal settlings out of crude oil!

Will Buy

Oily or Greasy Waste Materials (Fullers' Earth; Rejected Seeds or Beans; Oil Cake; etc), Preferably containing Coconut or Palm Kernel Oil, Animal Fat or Tallow.

Address: Box D14,
OIL & FAT INDUSTRIES

First Series of Tests to Determine the Keeping Quality of Well Settled Crude Cottonseed Oil and the Effect of Definite Amounts of "Settlings" Upon the Free Fatty Acid Content.

Effect of Meal Settlings on F. F. A. Content of Crude Cottonseed Oil

	Sample No. 1		Sample No. 2		Sample No. 3		Sample No. 4		Sample No. 5	
	Settled Oil	2% Meal Added	Settled Oil	2% Meal Added	Settled Oil	2% Meal Added	Settled Oil	2% Meal Added	Settled Oil	2% Meal Added
	F.F.A. %	F.F.A. %	F.F.A. %	F.F.A. %	F.F.A. %	F.F.A. %	F.F.A. %	F.F.A. %	F.F.A. %	F.F.A. %
At start	4.90	4.90	9.00	9.00	15.00	15.00	20.70	20.70	23.00	23.00
1st week	4.80	4.80	9.20	8.90	16.80	16.40	21.40	20.50	23.10	22.00
2nd week	4.90	5.10	9.20	9.60	16.80	16.80	21.40	21.00	23.10	22.40
3rd week	4.90	8.20	9.30	11.50	17.00	20.40	21.50	27.00	23.10	25.60
4th week	5.00	12.90	9.30	16.30	17.00	22.80	21.50	32.50	23.20	32.20
5th week	5.00	15.50	9.30	19.50	17.00	25.00	21.50	34.20	23.10	38.50
6th week	5.10	18.00	9.40	24.00	17.10	28.50	21.60	39.50	23.50	42.00
7th week	5.10	19.40	9.40	26.20	17.10	30.00	21.70	41.00	23.30	44.00
8th week	5.10	21.20	9.40	27.50	17.20	31.00	21.70	42.00	23.60	45.50
9th week	5.20	23.00	9.50	30.00	17.40	32.50	21.70	42.50	23.90	46.70
Maximum Increase of F.F.A.	.30	18.00	.50	21.00	2.40	17.50	1.00	21.80	.90	23.70

Second Series of Tests to Determine the Keeping Quality of Well Settled Crude Oil and the Effect of Definite Amounts of "Settlings" Upon Free Fatty Acid, Refining Loss and Color

	Settled Sample			Sample to which 1.5% Meal has been added			Sample to which 3.0% Meal has been added		
	F.F.A. %	Loss %	Red	F.F.A. %	Loss %	Red	F.F.A. %	Loss %	Red
First Sample—F.F.A. 2 to 3 per cent.									
At start	2.60	9.00	6.8	2.65	10.05	7.5	2.65	12.00	8.4
1st week	2.60	8.75	7.2	2.90	9.95	9.0	3.00	12.80	10.5
2nd week	2.65	9.05	7.6	3.30	10.85	10.2	3.70	13.60	10.6
3rd week	2.65	9.60	8.7	3.60	11.40	10.8	4.70	15.05	11.0
4th week	2.65	9.45	8.4	4.00	12.85	9.7	5.20	17.05	11.2
5th week	2.65	10.60	8.7	4.95	16.60	9.6	6.10	20.80	10.8
Second Sample—F.F.A. 3 to 4 per cent.									
At start	3.75	12.45	9.4	3.75	14.00	9.4	3.75	14.40	11.0
1st week	3.75	12.05	9.5	3.95	12.60	11.0	4.00	14.85	11.0
2nd week	3.80	13.15	9.3	4.25	13.00	10.5	4.60	17.05	10.2
3rd week	3.80	13.30	10.0	4.80	15.25	10.9	5.50	19.20	11.1
4th week	3.80	14.25	10.0	5.30	16.10	10.6	6.60	20.85	11.1
5th week	3.80	15.00	10.4	6.60	18.55	12.1	8.00	24.65	11.5
Third Sample—F.F.A. 4 to 5 per cent.									
At start	4.75	14.85	10.2	4.75	15.60	11.0	4.75	16.45	12.3
1st week	4.70	15.30	10.6	4.85	15.90	11.8	4.90	16.95	13.2
2nd week	4.75	14.80	11.3	5.20	16.95	12.2	5.40	18.50	13.1
3rd week	4.80	15.00	11.4	5.85	20.15	12.2	6.40	21.55	13.0
4th week	4.75	15.70	11.8	6.50	21.35	13.0	7.50	23.45	14.5
5th week	4.90	16.90	11.7	7.30	21.75	15.4	9.00	26.30	15.1
Fourth Sample—F.F.A. 5 to 6 per cent.									
At start	5.60	18.20	12.0	5.60	18.45	12.3	5.60	19.50	13.4
1st week	5.60	17.50	12.7	5.75	19.55	14.8	5.80	21.40	16.3
2nd week	5.65	17.35	13.0	6.10	20.15	14.3	6.35	21.85	14.9
3rd week	5.70	18.70	13.4	7.10	24.00	16.0	8.40	27.25	16.2
4th week	5.70	17.60	14.2	7.80	25.95	16.0	9.95	28.10	16.7
5th week	5.70	17.40	13.3	6.50	24.60	15.5	7.30	26.35	15.7
Fifth Sample—F.F.A. 6 to 7 per cent.									
At start	6.65	21.10	13.5	6.60	21.90	14.0	6.50	23.70	14.4
1st week	6.65	22.45	16.0	6.80	24.45	16.0	6.80	25.25	17.5
2nd week	6.70	21.10	14.1	7.30	24.45	15.8	7.90	26.55	16.4
3rd week	6.70	22.00	15.3	8.40	27.60	16.8	9.90	31.15	17.2
4th week	6.80	24.35	13.6	10.00	32.25	16.4	12.30	35.50	17.7
5th week	6.90	21.80	14.4	11.80	34.35	15.7	14.75	36.35	18.4
Sixth Sample—F.F.A. 7 to 8 per cent.									
At start	7.60	22.15	21.2	7.50	24.00	22.2	7.40	26.85	25.3
1st week	7.60	24.85	24.5	7.70	28.90	27.0	7.70	29.05	29.0
2nd week	7.65	24.25	21.0	8.10	28.90	26.0	8.30	29.30	28.0
3rd week	7.70	24.75	23.4	8.80	29.95	28.0	9.40	31.40	32.0
4th week	7.70	25.60	22.5	9.60	29.55	30.0	10.40	31.20	32.0
5th week	7.90	24.85	22.0	10.80	30.50	30.0	11.80	31.95	34.0
Seventh Sample—F.F.A. 8 to 9 per cent.									
At start	8.70	24.15	21.5	8.45	25.80	23.0	8.30	29.20	25.0
1st week	8.60	25.70	21.5	9.00	29.80	23.0	9.00	30.20	26.0
2nd week	8.60	25.60	20.0	9.40	29.50	24.2	9.70	30.70	26.0
3rd week	8.70	25.55	22.0	10.20	31.05	29.0	10.90	31.80	30.0
4th week	8.80	27.25	22.0	11.30	35.50	28.0	12.80	36.00	31.0
5th week	8.90	25.75	24.0	12.75	35.45	28.0	16.30	40.75	33.0
Eighth Sample—F.F.A. 9 to 10 per cent.									
At start	9.45	27.00	27.0	9.35	28.50	29.0	9.20	30.00	30.0
1st week	9.45	28.20	29.5	9.60	30.20	33.0	9.60	31.95	35.0
2nd week	9.40	27.20	30.0	9.90	30.60	33.0	10.20	31.45	39.0
3rd week	9.50	26.90	34.0	10.60	32.35	40.0	11.90	32.50	52.0
4th week	9.60	28.60	31.0	11.60	34.45	38.0	13.80	37.70	50.0
5th week	9.80	27.45	31.0	13.20	35.20	45.0	16.50	40.50	54.0

Is This Where Your Profits Are Going?

By THE EDITOR

KNOWING that our readers are interested in dollars and cents, we have applied the settlement terms of the Interstate Cottonseed Crushers' Association to the eight samples in Mr. Barrow's series of tests to determine the *excess* discount payable by the miller in each case where meal has been added. Bear in mind that these are only *excess* discounts over those shown by the analysis of the samples to which no meal had been added. All discounts are figured on the fifth week analysis of the sample which is not an unreasonable lapse of time after shipment for an arbitration analysis, and on the basis of eight cents per lb. for oil.

	Excess Discount on Sample containing 1.5% Meal. Per Tank Car (60,000 lbs.)	Excess Discount on Sample containing 3.0% Meal. Per Tank Car (60,000 lbs.)
Sample No. 1		
2–3% F. F. A.	$309.60	$540.00
Sample No. 2		
3–4% F. F. A.	211.20	489.60
Sample No. 3		
4–5% F. F. A.	321.60	532.80
Sample No. 4.		
5–6% F. F. A.	398.40	487.20
Sample No. 5		
6–7% F. F. A.	633.60	794.40
Sample No. 6		
7–8% F. F. A.	463.20	628.80
Sample No. 7		
8–9% F. F. A.	561.60	936.00
Sample No. 8		
9–10% F. F. A.	708.00	1,178.40
Average of 8 Samples	$450.90	$698.40

Against these figures should be credited the difference in value between meal and oil on the amount of meal shipped in the oil. Mr. Barrow has shown above that 0.2% of meal in the tank car will show 0.75% in the sample, so it will be generous to credit the miller with 1% of meal for 1.5% in the sample and with 2% meal for 3% in the sample. Allowing $40.00 per ton for meal and eight cents per pound for oil this will give the miller a credit of $36.00 per tank car in the first instance (1% meal) and $72.00 per tank car with two percent meal.

This reduces the average excess discounts above to $414.90 and $626.40 respectively.

Let us analyze these figures with relation to a season's operation of a four press mill, producing 24,000 lbs. of oil per day for 200 days, or eighty tank cars. If all the oil is close to prime in quality, as represented by Mr. Barrow's first sample, the loss to the miller due to leaving 1% of meal and settlings in the oil will average $273.60 per tank car or $21,888.00 for the season. If the oil should be badly off (as it is in some seasons) as represented by Mr. Barrow's eighth sample, this loss will average $672.00 per tank car, or $53,760.00 per season.

Basing the figures only on the average of Mr. Barrow's eight samples, 1% of meal and settlings left in the oil will cost the operator of a four press mill $33,232.00 each season, or 2% of meal and settlings will cost him $50,112.00 per season.

In the face of these proven facts and figures, it seems incredible that any oil-miller, rating himself a business man, can hesitate to equip his mill so that meal and settlings will be completely removed from the oil. This can be accomplished by the simplest of manufacturing operations, filtration through filter presses at very slight expense for equipment, and operation.

Refining Committee Progress Report

General Refining Committee

We have had considerable correspondence with various refining chemists regarding interpretation of certain points in connection with the revised refining procedure. This method has been found so far to work quite satisfactorily, although a few oils from West Texas have been found which do not refine with all strengths of lye quite satisfactorily. Further study is being given to this condition.

The new Interstate rule requiring premiums for quality of crude better than prime makes it necessary to give more attention to refining procedure for oils with less than 3% F.F.A. It will be necessary to specify and limit more closely the choice of lyes on such oils in order that different chemists will report concordant results. This matter is now being considered and a recommendation will be made in the near future.

It has been possible for the chairman to visit various refining chemists recently in Fort Worth, Dallas, Memphis and Atlanta, where in all cases a full discussion of refining procedure on this season's oils was held. I believe this has resulted in considerable benefit in bringing ideas of various chemists in line.

It is planned to send out a few co-operative samples this year through regular business channels to commercial laboratories without indicating that they are co-operative samples. This is intended to assure that they will receive only regular routine attention like other ordinary samples.

It is planned to study the refining of cold press oil during the season.

Neutral Oil Committee

This committee will study the neutral oil refining procedure on the same samples as are sent out for co-operative work above mentioned.

Color Committee

This committee has already begun sending out co-operative samples in the effort to get greater concordance among chemists and will study the changes that appear to take place in refined oil samples within the first week or two after refining.

Corn Oil Committee

This committee is planning to study the application of the revised refining procedure to corn oil during this season.

C. B. Cluff, *Chairman*

Preliminary Report of Cake Color Committee

The committee plans to accomplish the following during the current year.

1. Further study of relative merits of the two methods of color comparison already proposed and also of the method based upon use of a weak lens out of focus.

2. Study of effect of kind of illumination upon the color comparison.

3. Recommendation of a method for official adoption.

Progress has been made on item 1. above. Indications are favor-

able to the method based upon use of a weak lens out of focus as the simplest satisfactory method of making the color comparison. However, it is too early to predict what the final recommendation will be.

A. S. Richardson, *Chairman*

Linseed Oil Committee

I have taken the matter up with the several chemists who are employed by the linseed manufacturers and I believe they all have indicated their willingness to cooperate on some comparative tests on linseed products within the ensuing year. Some of them, of course, are not members of the American Oil Chemists' Society. I have advised them that it will be necessary for them to join and most of them have replied that they will be glad to do this and also join in on the work.

The work I have planned for this Committee to do is to co-operate on the ordinary physical tests which are used for linseed and its products, such as the determination of the oil content of the seed, as well as the impurities, and the physical constants of linseed oil, paying particular and especial attention to make the comparative tests that are known, such as the Hanus and Wijs methods for determining the iodine number. It is a well-known fact that there are few chemists, especially public and government chemists, who use the same determination or method for the iodine number, and it is very essential in doing this to have the method used well established and well proven that it is workable and checkable. We have therefore decided to work along the lines just mentioned which will be comparative, I believe, to the earlier work which was done by the members of the old Cotton Products Analysts Society.

If any member has any suggestions to offer that might be of assistance to us, we will be very glad to get them.

B. H. Thurman, *Chairman.*

Smalley Foundation Committee

All that I am prepared to report at this time is that there are at present enrolled eighty-seven collaborators. From correspondence pending, there will be one additional name within a short time.

This is the largest enrollment we have ever had at this date. Last year at this time we had only eighty-five names on our list and at the close of the year eighty-eight.

The meal samples this year are being prepared under the supervision of Mr. T. C. Law of Law & Company, Atlanta, Georgia.

H. C. Moore, *Chairman*

Olive Oil Committee

To the members of the Olive Oil Testing Committee of the American Oil Chemists' Society,

We have before us the problem of detecting in Edible Olive Oil, small quantities of Extracted Olive Oil containing Sulphur from the Carbon Disulphide solvent.

The Chairman's laboratory has tried the three methods as outlined by M. F. Lauro in the September, 1927, issue of OIL & FAT INDUSTRIES, page 324, namely:

(1) Coin Test

(2) Acetic Anhydride (Italian) Test.

(3) Silver Benzoate Test.

We find as follows:

Coin Test. With 100% Extracted Olive Oil—a very definite

blackening of the coin. With 10% Extracted Oil and 90% Edible Olive Oil (by volume)—no definite blackening to enable a decision.

Acetic Anhydride Test. With 100% Extracted Olive Oil—a distinct rose-red coloration. With 10% Extracted Oil and 90% Edible Oil—A very slight pink coloration, that is, not very definite but better than the coin test for corresponding amounts.

Silver Benzoate Test. With 10% Extracted Oil and 90% Edible Oil—a very dark brown coloration. With 5% Extracted Oil and 95% Edible Oil—a dark brown coloration, about half the coloration of 10%. With 1% Extracted Oil and 99% Edible Oil—a definite brown coloration, distinctly different from 100% Edible Olive Oil.

Results: Since believing that Edible Olive Oil would not be adulterated with less than 6% Extracted Olive Oil, suggest that M. F. Lauro's Silver Benzoate Test be tried by all members of the committee in order to decide for the adoption of this Silver Benzoate Method which is definite to 1% Extracted Olive Oil.

For the test the Silver Benzoate was made from Silver Nitrate and Sodium Benzoate by precipitation from hot aqueous solution, cooling, washing with cold water and drying. 20 milligrams was used to 5 cc. of mixed Olive Oils, heating to 150° C., using an oil bath.

Louis M. Roeg, *Chairman*

Preliminary Report Detergents Committee

Immediately upon appointment, the Chairman and Vice-Chairman of the Detergents Committee began an intensive study of what they considered the greatest obstacle confronting the collaborators, namely, the preparation of a standard soiled cloth.

While the results of last year's work indicated clearly that the experimental washing device was very unsatisfactory, the fact that the soiling procedure employed produced a cloth which was hardly washable and thus introduced a complex factor of measurement of the degree of whiteness obtained (or amount of soil removed), the solution of this difficult problem seemed a positive necessity before any real further progress could be made.

Last year's results indicated that for the purpose of this collaborative work the soiled cloth should be prepared at one source, to eliminate as far as possible, the personal equation.

The Chairmen have sought to prepare a cloth which, as far as the actual soiling was concerned, could be prepared mechanically and thus to further reduce the personal equation and establish a standard which would be reproducible.

The Chairmen have also sought to divise a soiled cloth which could be washed under standard conditions of commercial laundering and be in such condition that no measurement of residual soil should be necessary. To accomplish this end the Chairmen have devised a pattern type cloth upon which the soil is placed in pattern against a white background. When the soil is completely removed it is readily discerned by the absence of all traces of the outline of the pattern when the washed fabric is held and viewed against the light.

The Chairmen have produced a cloth having these properties by printing in stripes upon bleached cotton cloth, a paste containing:

(*Continued on page* 393)

President's Midyear Report

American Oil Chemists Society Meeting

By H. P. TREVITHICK, President

SINCE the meeting in May at which I had the honor of being elected President, there have been several events which are of considerable importance to the Society. The most important has been the establishment of a Research Associate at the Bureau of Standards.

Color Glass Standardization

In 1912 Dr. Smalley of the Southern Cotton Oil Company and Dr. Priest of the Bureau of Standards started cooperative work with the idea of eliminating the differences in reading colors. Since then possibly $50,000 has been spent in developing various instruments for the reading of colors, one of which in particular is the Color Analyzer which is being sold by Keuffel & Esser. This instrument, while a beautiful piece of scientific apparatus, expresses colors with a group of figures rather than one figure. In Cotton oil particularly and also in the several other Vegetable oils, premiums are paid or claims are made on the basis of the red content of the oil, and so far there has been no instrument developed which has replaced the Lovibond system satisfactorily by giving its readings in one unit. We have therefore standardized the instrument to be used for the Lovibond glasses and have endeavored to purchase glasses which also would be standard, but the Lovibond glasses can not be purchased in standard sets, nor are the glasses uniformly and correctly labelled.

Although for the last two or three years, the Bureau of Standards under Dr. Priest has been developing actual standards for the Lovibond glasses, heretofore there has been no actual scientific value for these glasses. This work is finished and now the Bureau has available the apparatus for checking our glasses, but it does not have the personnel. No appropriation would be available until after July 1st, 1928, and in order that there may be no further delay, the Governing Board has engaged Miss Walker as research associate at the Bureau to investigate "The Uniformity of the Lovibond Glasses in Use at the Present Time." To do this work it will of course be necessary for her to grade all the glasses submitted. At present she is developing a method of compar-

H. P. Trevithick

ing the glasses rapidly and will soon be able to start actual work on the glasses.

Mr. A. W. Putland, Chief Chemist of the Portsmouth Cotton Oil Refining Corporation, is the representative of the Society in charge of this work and will receive all the glasses which are to be submitted to Miss Walker. She will report to him the actual values determined in her research and the Society will then issue A.O.C.S. certificates for the value of each glass. The cost of this work to the members will be $1.50 per glass.

Fall Meeting

Another development has been the arrangement for this fall meeting in New York. The Constitution and By-Laws provide that the Annual Meeting shall be held in the Spring of the year with the election of officers and the transaction of any other business brought before the meeting. They also provide that between the Annual meetings, the Governing Board of the Society has full power to act. This Meeting here today is not provided for by the Constitution and By-Laws, and is more of a get-together for the members of the Northern Section of the Society who are not able to spare the time to attend the annual meetings. It does not seem proper that this meeting should transact any business, but any recommendations or ideas developed can be presented to the Governing Board for action immediately if necessary or can be submitted to the Annual Meeting of the Society next Spring.

Committee Organization

There has also been considerable work reorganizing the Committees and organizing new ones. Due to press of business, Mr. Hoyt of the Larkin Company was compelled to resign as Chairman of the Detergent Committee and some of the members felt that it was not possible to carry the work through to a successful conclusion. They therefore felt that the matter should be discussed by the Committee before re-organization. The consensus of the replies from the members to this suggestion was that while it was doubtful that successful results could be obtained, it was necessary to carry the work through to a conclusion even if it took several years. I believe that every member of the Committee answered the inquiry on this subject. Mr. Guernsey of the Cowles-Detergent Co. accepted the Chairmanship and Mr. Howell of the same Company the Vice-Chairmanship of this Committee, the idea being that it was better to have two men in charge because of the large amount of work entailed in the Chairmanship.

There has also been a new Committee organized to work on Olive Oil under the Chairmanship of Dr. L. M. Roeg of Worcester, Mass., and also one on Corn Oil under the Chairmanship of Mr. M. M. Durkee of A. E. Staley Mfg. Co. There is also a new Ammonia Committee under Mr. R. M. Chapman to develop the presence of added Ammonia Salts in Fertilizers such as, Cotton Meal, and there is being formed a Committee on Linseed Oil under the Chairmanship of Mr. B. H. Thurman of the American Linseed Co.

The Committees are as follows:

Smalley Foundation, H. C. Moore, Chairman.

Committee to Investigate Dubosq Colorimeter, David Wesson, Chairman.

Analysis of Commercial Oils & Fats, W. D. Richardson, Chairman.

Moisture Committee, W. H. Irwin, Chairman.

Cake Color Committee, R. S. Richardson, Chairman.

Referee Board, H. J. Morrison, Chairman.

Committee for Prize Awards for Journal, David Wesson, Chairman.

Basic Research Committee, E. R. Barrow, Chairman.

Ammonia Committee, R. M. Chapman, Chairman.

Linseed Oil Committee, B. H. Thurman, Chairman.

Olive Oil Committee, L. M. Roeg, Chairman.

Uniform Methods Committee, N. C. Hamner, Chairman.

Detergents Committee, F. H. Guernsey, Chairman.

Effect of Crude Mill Operations on Oil, Andrew K. Schwartz, Chairman.

Membership Committee, A. W. Putland, Chairman.

Refining Committee, C. B. Cluff, Gen. Chairman.

Sub-Committee A—Neutral Oil Committee, Claude E. McLean, Chairman.

Sub-Committee B—Color Methods, J. D. Evans, Chairman.

Sub-Committee C—Corn Oil Refining, M. M. Durkee, Chairman.

Planning Committee, H. J. Morrison, Chairman.

Revision Committee, C. B. Cluff, Chairman.

Any Members who are interested in the work of any of these Committees are urged to give their names in to the President for appointment on these Committees.

The Smalley Foundation under Mr. H. C. Moore has been having the samples prepared and distributed by Mr. Ray Montsalvatage of Savannah. Due to the fact that Mr. Montsalvatage has gone into other lines of work, it was necessary that he discontinue the preparation of these samples. With considerable reluctance, Mr. Thomas C. Law has consented to prepare them. The preparation of these samples entails considerable work and the Society owes Mr. Law a vote of thanks for consenting to undertake it.

The Planning Committee has also been reorganized this year with Mr. Morrison as Chairman, with two purposes in view—first, that the Chairman would keep a record of the work of all Committees so that in case questions arise at future times, they can be referred back to the work that was done on that same question previously; second, the personnel has been chosen to represent the different classes of membership in the Society. Thus—Mr. Morrison represents Soaps, Mr. Aspegren Cotton Oil, Mr. Thurman Linseed Oil, Mr. Vollertsen the Packing House Industry and Professor Gill Miscellaneous Oils.

(*Continued from page 390*)

100	parts	wheat starch
6	"	gum tragacanth
20	"	tallow (A.O.C.S.)
20	"	Mineral Oil (A.O.C.S.)
30	"	lampblack (A.O.C.S.)
824	"	water

After drying, the composition of the soil is:

Starch	56.82%
Gum Tragacanth	3.41
Tallow	11.36
Mineral Oil	11.36
Lampblack	17.04
	99.99

This cloth may be washed white by five commercial washings. It

is mechanically prepared, and the personal equation is largely eliminated. No measurement of residual soil is necessary.

Samples of this cloth have been sent to the various collaborators and their comment and opinion requested. A further adjustment of the soil composition may be advisable to better meet laboratory washing conditions, but this may easily be accomplished.

The Chairmen undertook this work single-handed, as a means of speeding up progress on what is considered the most troublesome problem. From a considerable number of practical tests in commercial laundries, it is their opinion that the ideas incorporated in this cloth yield a standard closely approaching the ideal. Volunteers have been called for to work out a new machine for laboratory washing. If this phase of the work does not yield tangible progress within a reasonable period an effort will be made to arrange parallel washing tests in commercial "pony" washers.

F. H. Guernsey, *Chairman.*
L. T. Howells, *Vice-Chairman.*

Quinn Elected Head of Salesmen's Association

At the recent annual election of officers of the Salesmen's Association of the American Chemical Industry, Mr. Robert J. Quinn, Assistant Manager of Sales of Mathieson Alkali Works, New York, was elected President of the Association for 1927-1928.

Robert J. Quinn
President Salesmen's Association
American Chemical Industry

Mr. Quinn was born in Chicago, graduated from the University of Illinois (B.S. in Chemical Engineering) in the class of 1912 and before joining the Mathieson organization in 1920 as Chicago District Sales Manager, was Chief Chemist and Superintendent of the Ammonia Department for Morris and Company, the Chicago Packers, and consulting chemist for the Midland Chemical Co. of Argo, Ill. Since 1923 he has been assistant manager of all sales for the Mathieson company, with headquarters at the main office in New York.

Mr. Quinn is one of the best known and most popular of the younger men in the chemical manufacturing business, and has many friends in the oil and soap industries. The Salesmen's Association is to be congratulated on its choice of a President for the coming year, for the organization is certain to make substantial progress under Mr. Quinn's leadership.

Early History of the American Oil Chemists' Society

Address Delivered by David Wesson Before the Mid-Year Meeting of the Society, October 28, 1927

IN 1884 there were very few chemists in this country familiar with the chemistry of fats and oils.

William B. Allbright who had been with N. K. Fairbank Company of Chicago, for several years, was probably the best posted man of the industry at that time. Armour and Company made the boast that they had no chemists and that Fairbank, by means of a chemist, took all the good quality out of his products.

With the formation of the American Cotton Oil Trust in 1888, chemists and their work became more appreciated. At that time, however, there were very few really trained chemists in the business which as time went on called for more and more chemists till every large company employed either a chemist or somebody who called himself such. As the chemists became more and more appreciated by the trade, their advice was relied upon in forming rules for transactions in cottonseed products.

Chemists of different companies used to attend the Conventions of the Interstate Cottonseed Crushers Association and about 1904 an advisory Committee of three chemists was appointed to aid the rules committee in their work. A larger committee was formed in 1909 and their first printed deliberations were published in that year.

At the annual Convention of the Interstate Cottonseed Crushers Association a number of chemists were present, and talking among themselves, decided it would be a good plan to form an Oil Chemists' Society. It was a very interesting occasion and some fine political work was done by the chemists representing the different conflicting interests to see that particular companies should receive as much influence as possible in the makeup of the new Society. There were so few trained chemists among the probable membership that it was decided to adopt the name of Cotton Products Analysts. As the industry grew it came to depend on chemistry more and more. Many of the leading chemists of the country joined the Society and its name was changed in 1921 to The American Oil Chemists' Society.

There is a big field for such a Society. It should not be limited to the cotton oil industry, but should have among its members those working in animal oils, paints, soaps, all kinds of vegetable oils and in fact everything of a fatty nature except petroleum and its products which obviously occupy a quite different field.

The Society now has a great many such chemists as members and will undoubtedly soon number in its ranks all the capable oil and soap chemists of the country.

Application Blanks for membership in the American Oil Chemists' Society may be obtained from OIL AND FAT INDUSTRIES.

Stearic Acid and Red Oil Specifications

National Association Adopts Standards for All Varieties of Products.

THE National Association of Stearic Acid Manufacturers, F. F. Jordan, Secretary-Treasurer, Cincinnati, Ohio, has adopted standard specifications for all grades of stearic acid and red oil (oleic acid), which specifications are given in full below.

Mr. Jordan, the Secretary of the Association, will be glad to answer the inquiries of anyone interested in these specifications, and upon request, will furnish details of the approved methods of testing the products dealt in by members of the Association.

Specifications for Stearic Acid and Red Oil Adopted by The National Association of Stearic Acid Manufacturers

Single-Pressed Stearic Acid

Melting Point—126° to 127° F. (52.2° to 52.75° C.)
Iodine Value —Not over 12
Construction —Needle point crystalline

Double-Pressed Stearic Acid

Melting Point—128° to 129° F. (53.3° to 53.9° C.)
Iodine Value —Not over 8
Construction —Needle point crystalline

Triple Pressed Stearic Acid

Melting Point—130° to 131° F. (54.4° to 55° C.)
Iodine Value —Not over 6
Construction —Needle point crystalline

Distilled Red Oil

	Regular	Medium	Heavy
Titre	7°–10°	15°–20°	30°–35°
Unsap.	5% or under	5% or under	5% or under
Moisture and insoluble.	0.5% or under	0.5% or under	0.5% or under
Iodine Value	90% or under	84% or under	70% or under

Double Distilled Red Oil

Titre	10°–13°
Moisture and Insoluble	0.5% or under
Iodine Value	90% or under

Color, not over 3 N. P. A.

Saponified Red Oil

	Regular	Medium	Heavy
Titre	18°–20°	14°–16°	30°–32°
Unsap.	3% or under	3% or under	3% or under
Moisture and insoluble.	0.5% or under	0.5% or under	0.5% or under
F. F. A.	84% or under	84% or under	84% or under
Iodine Value	80% or under	84% or under	70% or under

The Standardization of Oil for Mayonnaise

Growing Industry Requires Supreme Quality in Raw Materials

By ROSALIND U. NORRIS*

FROM the commercial point of view, the production of mayonnaise is a comparatively new thing, so that it has only been within very recent years that there has arisen the demand for an edible oil particularly suited for this purpose. Originally mayonnaise was made in France from olive oil, the natural oil of that country, and when it was first produced in the United States, imported oils were used almost exclusively. It was soon found out, however, that olive oil was not an entirely satisfactory mayonnaise oil as its flavor was too decided for the average American taste, and the rapidity with which it would turn rancid upon standing constituted a serious drawback. Good American oils are now, however, replacing the imported ones, and the higher the quality of the domestic oils, the greater the possibilities are for complete substitution. This is an age of standardization, and when there is a marked growth in any new product, there is always an accompanying specialization in the raw materials that make up that product, for it is only after experience has demonstrated the need of a definite quality of oil for mayonnaise, that such an oil can be refined and produced.

Mayonnaise Manufa[illegible] Difficult in Practice

There is probably no product so simple in theory that is as difficult to make in actual practice as is mayonnaise. This is due to several reasons, but principally to the fact that although the process of manufacture is a simple mechanical one, so much depends upon the quality of the raw materials that it is necessary to exercise every possible precaution in their selection. As a true mayonnaise contains upwards of fifty per cent of oil, possibly more depends upon the oil, than upon any other one ingredient, and it is because of this that a new standard has arisen for mayonnaise oil. Heretofore it has been common parlance to use such terms as "Salad" Oil and "Butter" Oil, and with the use of these terms certain grades and specifications have been accepted. Now with the coming use of the words "Mayonnaise" Oil, a new and even higher standard must be understood, agreed upon and maintained.

Oil Must Meet Rigid Specifications

In setting the standard for a "Mayonnaise" Oil it is necessary to consider the specific conditions under which that oil is to be used. Agitation in the presence of air and moisture is believed by some authorities to be the primary cause of rancidity, while Wagner, Walker and Oestermann (J. S. C. I. 1913,32,759) found that fats kept in an atmosphere of nitrogen but exposed to the light became rancid, and thereby concluded that light must be the determining factor. Since, therefore, the oil of mayonnaise, must of necessity be subjected to these very conditions,

* Chemist, Richard Hellman, Inc.

namely, agitation, light, air and moisture, it is evident that it must, at the start of the manufacturing process, be perfecly free from even slight traces of rancidity. The flavor of the oil, not only alone, but when it is combined with spices and vinegar, brings up another important point for consideration, for a finely flavored salad or cooking oil is not necessarily desirable for mayonnaise. Its color, its behavior when combined with other ingredients, its "blending"possibilities, and its tendency to change its physical or chemical properties upon standing, are all specific problems that are of interest to the manufacturer of mayonnaise, and it is for these reasons, that many years of actual manufacturing experience has demonstrated the need of drawing up the following specifications as a standard.

STANDARDS AND SPECIFICATIONS FOR A REFINED DEODORIZED "MAYONNAISE" OIL

Article 1 Shall comply with the rules and regulations of the New York Produce Exchange, except as herein amended.

Article 2 Shall be unadulterated and free from substances unnatural to it except when placed therein by any Government authority, but such modification must be stated in the contract and the nature of the admixture specified. An exception to the above shall allow a toleration of one-quarter of one per cent contamination by a vegetable oil of similar character.

Article 3 Shall not be darker than the combined glasses of 35 Yellow 7.6 Red, nor lighter than the combined glasses of 35 Yellow 5.5 Red of the Lovibond Color Scale.

Color is an arbitrary factor and one which is to a certain extent governed by personal preference. On general principles, however, a mayonnaise that has a golden yellow color is more to be desired than one of a lighter shade, and since an unadulterated mayonnaise derives most of its color from the oil, a relatively dark oil is best for this purpose.

Article 4 Shall be brilliant, free from water and settlings and sweet in odor and flavor

Flavor and odor are of first importance, for many people are what could be termed "oil-sensitive," and are therefore particularly critical of even slight variations in taste and smell. A good oil for mayonnaise is one that is as bland and tasteless as is possible, for the flavor of mayonnaise is obtained through added spice and not through any flavor of the oil itself.

Article 5 Shall stand limpid (clear and brilliant) for five hours at the following temperatures.

	For Winter Cottonseed Oil—32° F. For Corn Oil 22°—27° F. For Sesame Oil—21°—25° F.	Article 7	Shall give a negative Kreis Test undiluted. The extreme sensitiveness of the Kreis Test is not a drawback to the mayonnaise Chemist, as it enables him to detect the presence of incipient rancidity before it has become evident to the senses. Neither need it be looked upon as an unfair specification by the oil refiner as within the last twenty-two months over 1,200 samples of oil analyzed in the author's laboratory were found to give a negative Kreis reaction, thereby proving that it is not a standard which a refiner is unable to meet.
Article 6	Shall not contain more than 0.1 of one percent free fatty acid, calculated as oleic acid, with the standard set for 0.05 of one percent. Here again experience has shown that the lower the acidity the better the oil is for the production of mayonnaise, for although there seems to be little or no relationship between the acid content and the degree of rancidity, a high acidity has a marked effect upon the flavor and general quality of the finished product.		

Emery Candle Company Establishes Fellowship

The Emery Candle Company announces that it has established a fellowship at The Mellon Institute of Industrial Research, University of Pittsburgh, Pittsburgh, Pa., under the direction of Dr. Robert N. Wenzel of Palo Alto, California, who will conduct research in tallows and greases, looking toward the betterment of distillation and saponification processes.

Dr. Wenzel was formerly a professor of chemistry at Leland Stanford University, and has had practical research experience.

NOTICE TO OIL MILLS

Oil Millers who plan to Increase Their Profits (under the new Oil Settlement Rule), by Filtration of their crude oil, should write for Our Complete List of Filter Press Offerings.

Bargains in Filter Presses

1 Shriver, 42 x 42	2 Sperry, 30 x 30
2 Shriver, 36 x 36	2 United, 24 x 24
1 Johnson, 36 x 36	2 Shriver, 24 x 24
3 Shriver, 30 x 30	1 Sperry, 24 x 24

All suitable for oil work. Write for other Sizes

Miscellaneous: Boilers, Tanks, Pumps, Kettles, Evaporators, Dryers, Grinders, Mills, Presses, Cooling Rolls, Soap Machinery.

NOTE: We buy your surplus equipment or idle plant for cash. Try our service

CONSOLIDATED PRODUCTS CO., Inc., 17 Park Row, New York City, Barclay 0603

Third Quarter Census Report

THE Department of Commerce announces that the factory production of fats and oils (exclusive of refined oil and derivatives) during the three-month period ended September 30, 1927, was as follows: Vegetable oils, 524,720,075 pounds; fish oils, 36,-869,026 pounds; animal fats, 484,-996,341 pounds; and grease, 91,-019,837 pounds; a total of 1,137,-605,279 pounds. Of the several kinds of fats and oils covered by this inquiry, the greatest production, 372,972,417 pounds appears for lard. Next in order is cottonseed oil with 246,796,510 pounds; then linseed oil with 169,273,970 pounds; tallow with 109,858,911 pounds; coconut oil with 65,606,934 pounds; and corn oil with 30,395,-909.

The production of refined oils during the period was as follows: Cottonseed, 164,848,061 pounds; coconut, 57,003,280 pounds; peanut, 1,295,760 pounds; corn, 23,708,114 pounds; soya - bean, 2,258,807 pounds; and palm-kernel, 537,744 pounds. The quantity of crude oil used in the production of each of these refined oils is included in the figures of crude consumed.

The data for the factory production, factory consumption, imports, exports, and factory and warehouse stocks of fats and oils and for the raw materials used in the production of vegetable oils for the three-month period appear in the following statements:

PRODUCTION, CONSUMPTION AND STOCKS OF FATS AND OILS

(In some cases, where products were made by a continuous process, the intermediate products were not reported)

Kind	Factory operations for the quarter ended Sept. 30, 1927		Factory and Warehouse stocks Sept. 30, 1927
	Production	Consumption	
Vegetable Oils:[1]	(pounds)	(pounds)	(pounds)
Cottonseed, crude	246,796,610	184,517,438	87,474,145
Cottonseed, refined	164,848,061	348,821,457	225,782,051
Peanut, virgin and crude	1,599,875	1,691,394	569,571
Peanut, refined	1,295,760	1,450,870	656,416
Coconut, or copra, crude	65,606,934	131,383,609	90,679,756
Coconut, or copra, refined	57,003,280	54,822,183	15,429,547
Corn, crude	30,395,909	30,947,769	14,257,940
Corn, refined	23,708,114	3,940,136	7,774,175
Soya-bean, crude	285,935	3,542,106	6,372,937
Soya-bean, refined	2,258,807	825,292	1,634,988
Olive, edible	.....	663,666	7,460,847
Olive, inedible	.....	1,586,329	915,666
Sulphur oil, or olive foots	.....	9,773,415	6,228,059
Palm-kernel, crude	.....	5,279,403	7,943,099
Palm-kernel, refined	537,744	372,728	162,861
Rapeseed	.....	4,235,192	4,302,768
Linseed	169,273,970	120,116,744	117,211,645
Chinese wood or tung	.....	19,017,367	15,339,135
Chinese vegetable tallow	.....	1,680,089	1,238,054
Castor	10,550,891	5,331,480	7,041,380
Palm	.....	28,700,050	30,920,748
All other	209,951	2,031,418	5,819,852

Kind	Factory operations for the quarter ended Sept. 30, 1927 Production (pounds)	Consumption (pounds)	Factory and Warehouse stocks Sept. 30, 1927 (pounds)
Fish Oils:[1]			
Cod and cod-liver	580,259	4,387,353	7,009,720
Menhaden	13,682,402	11,823,532	23,591,178
Whale	6,272,625	16,655,232	34,927,327
Herring, including sardine	14,982,975	6,371,173	17,062,526
Sperm	53,475	150,387	1,005,954
All other, including marine animal	1,297,290	2,106,958	824,658
Animal Fats:			
Lard, neutral	7,598,949	5,314,371	5,489,217
Lard, other edible	365,373,468	3,493,260	89,545,487
Tallow, edible	11,513,550	10,916,290	2,234,510
Tallow, inedible	98,345,361	140,024,274	90,034,889
Neat's-foot oil	2,165,013	1,571,355	1,465,615
Greases:			
White	15,765,631	7,018,060	5,644,097
Yellow	15,698,259	12,838,454	9,121,138
Brown	12,334,028	9,293,149	9,567,388
Bone	6,624,088	295,326	2,421,070
Tankage	13,330,095	267,420	4,186,728
Garbage or house	22,406,840	21,150,932	12,412,307
Wool	1,904,804	1,662,721	3,440,203
Recovered	768,649	671,762	1,365,580
All other	2,187,443	1,408,166	3,004,849
Other Products:			
Lard compounds and other lard substitutes	348,207,614	189,553	22,929,059
Hydrogenated oils	130,457,764	128,154,600	10,293,826
Stearin, vegetable	3,641,681	4,942,146	1,201,028
Stearin, animal, edible	15,880,604	14,698,663	2,621,346
Stearin, animal, inedible	3,650,175	7,429,391	3,479,928
Oleo oil	29,265,883	11,618,488	7,447,945
Lard oil	7,716,335	4,638,358	4,810,163
Tallow oil	3,308,649	2,109,153	1,510,097
Fatty acids	40,662,896	42,796,566	6,190,798
Fatty acids, distilled	13,623,893	11,022,824	4,099,843
Red oil	13,402,710	4,910,124	7,300,032
Stearic acid	8,181,126	2,563,616	2,778,548
Glycerin, crude 80% basis	32,591,426	31,199,193	18,683,549
Glycerin, dynamite	11,206,709	6,276,922	16,494,518
Glycerin, chemically pure	14,302,533	1,702,780	8,256,568
Cottonseed foots, 50% basis	32,148,991	46,947,000	48,108,896
Cottonseed foots, distilled	41,985,455	40,827,836	6,249,268
Other vegetable oil foots	17,436,221	15,979,430	1,951,124
Other vegetable oil foots, distilled	338,096	255,486	194,965
Acidulated soap stock	20,068,325	20,597,707	9,908,861
Miscellaneous soap stock	31,894	71,265	55,146

[1] The data of oils produced, consumed and on hand by fish oil producers and fish canners were collected by the Bureau of Fisheries.

Raw Materials Used in the Manufacture of Vegetable Oils

Kind	Tons of 2,000 pounds: Consumed July 1 to Sept. 30	Tons of 2,000 pounds: On hand Sept. 30
Cottonseed	810,174	644,954
Peanuts, hulled	2,260	572
Peanuts, in the hull	93	52
Copra	50,945	9,340
Coconuts and skins	1,408	.....
Corn germs	51,051	312
Flaxseed	253,431	119,729
Castor beans	12,196	1,750
Mustard seed	337	1,297
Soya-beans	1,052	58
Other kinds	143	105

Imports of Oil Seeds, Quarter Ended September 30, 1927

Kind	Tons	Kind	Tons
Castor beans	6,992	Poppy seed	343
Copra	56,220	Perilla and sesame seed	476
Flaxseed	2,110	Other oil seeds	1,792

Imports of Foreign Fats and Oils, Quarter Ended September 30, 1927

Kind	Pounds	Kind	Pounds
Whale oil	719,370	Palm oil	53,022,369
Cod and cod-liver	7,735,328	Palm-kernel oil	11,176,167
Other fish oils	5,298,840	Peanut oil	461,841
Animal fats and oils, edible	1,744,466	Rape oil	4,192,950
Wool grease	2,351,876	Linseed oil	113,088
Grease and oils, n. e. s. (value)	$112,856	Sesame oil	287,421
Chinese wood oil or nut oil	18,715,955	Soya-bean oil	5,546,548
Coconut oil	64,403,117	Vegetable tallow	590,980
Olive oil, edible	15,174,070	Vegetable wax	2,180,443
Sulphur oil, or olive foots	9,549,251	Other vegetable oils	2,003,811
Olive oil, denatured	1,162,058	Glycerin, crude	4,918,296
		Glycerin, refined	1,833,690

Exports of Foreign Fats and Oils, Quarter Ended September 30, 1927

Kind	Pounds	Kind	Pounds
Animal fats and oils, edible	7,653	Olive oil, edible	25,612
Fish oils	69,631	Palm and palm-kernel oil	1,452,106
Other animal oils, fats and greases	142,228	Peanut oil	73,194
Chinese wood oil or nut oil	1,285,466	Soya-bean oil	249,582
Coconut oil	2,092,585	Other vegetable oils	53,486
		Vegetable wax	230,282

Exports of Domestic Fats and Oils, Quarter Ended September 30, 1927

Kind	Pounds	Kind	Pounds
Oleo oil	17,812,396	Other animal greases, oils and fats	18,472,129
Neats-foot oil	382,288	Coconut oil	4,581,908
Other animal oils	156,144	Cottonseed oil, crude	4,491,677
Fish oils	176,852	Cottonseed oil, refined	2,564,400
Oleo stock	2,866,266	Linseed oil	530,829
Tallow	1,819,219	Soya-bean oil	1,812,351
Lard	157,523,856	Corn oil	41,307
Lard, neutral	4,055,651	Vegetable oil lard compound	1,432,359
Lard compound, containing animal fats	2,002,813	Vegetable soap stock	1,315,835
Oleo and lard stearin	1,282,005	Other vegetable oils and fats	2,990,851
Grease stearin	853,128	Glycerin	167,284
Oleic acid, or red oil	729,248		
Stearic acid	526,404		